

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1. (Currently amended) A method for detecting violations of type rules in a
2 computer program, comprising:
3 receiving the computer program prior to compilation and execution,
4 wherein the computer program is received in source code form, and wherein the
5 method further comprises parsing the computer program into an intermediate form
6 prior to locating a type casting operation;
7 locating a the type casting operation within the computer program,
8 wherein the type casting operation involves a first pointer and a second pointer;
9 checking the type casting operation for a violation of a type rule; and
10 if a violation is detected, indicating the violation.

1 2. (Original) The method of claim 1, wherein checking the type casting
2 operation involves determining if the first pointer is defined to be a structure
3 pointer and the second pointer is not defined to be a structure pointer, and if so,
4 indicating a violation if no char exception applies.

1 3. (Original) The method of claim 2, wherein indicating the violation
2 involves:
3 generating a warning to warn a programmer of a potential type violation if
4 the second pointer is a void or char pointer; and

5 generating an error to indicate a type violation to the programmer if the
6 second pointer is a pointer to a scalar.

1 4. (Original) The method of claim 1, wherein if the first pointer is defined
2 to point to a first structure type and the second pointer is defined to point to a
3 second structure type, the method further comprises:
4 determining whether the first structure type and the second structure type
5 belong to the same alias group; and
6 if the first structure type and the second structure type do not belong to the
7 same alias group, generating an error to indicate a type violation.

1 5. (Original) The method of claim 4, wherein determining whether the first
2 structure type and the second structure type belong to the same alias group
3 involves:
4 keeping track of special program statements that link structure types into
5 alias groups;
6 determining that the first structure type and the second structure type
7 belong to the same alias group if the first structure type and the second structure
8 type are the same structure type, or if one or more special procedures link the first
9 structure type and the second structure type into the same alias group.

1 6. (Original) The method of claim 5, further comprising determining that
2 the first structure type and the second structure type belong to the same alias
3 group if the first structure type and the second structure type have all the same
4 basic types in the same order.

1 7. (Canceled).

1 8. (Original) The method of claim 1, further comprising:
2 receiving an identifier for a set of constraints on memory references that a
3 programmer has adhered to in writing the computer program; and
4 using the identifier to select a type casting rule from a set of type casting
5 rules, the selected type casting rule being associated with the set of constraints;
6 wherein each type casting rule in the set of type casting rules is associated
7 with a different set of constraints on memory references.

1 9. (Original) The method of claim 1, wherein the method is performed by a
2 compiler.

1 10. (Original) The method of claim 1, wherein the method is performed by
2 an error checking application, which is not part of a compiler.

1 11. (Currently amended) A computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform a
3 method for detecting violations of type rules in a computer program, the method
4 comprising:
5 receiving the computer program prior to compilation and execution,
6 wherein the computer program is received in source code form, and wherein the
7 method further comprises parsing the computer program into an intermediate form
8 prior to locating a type casting operation;
9 locating a the type casting operation within the computer program,
10 wherein the type casting operation involves a first pointer and a second pointer;
11 checking the type casting operation for a violation of a type rule; and
12 if a violation is detected, indicating the violation.

1 12. (Original) The computer-readable storage medium of claim 11,
2 wherein checking the type casting operation involves determining if the first
3 pointer is defined to be a structure pointer and the second pointer is not defined to
4 be a structure pointer, and if so, indicating a violation if no char exception applies.

1 13. (Original) The computer-readable storage medium of claim 12,
2 wherein indicating the violation involves:
3 generating a warning to warn a programmer of a potential type violation if
4 the second pointer is a void or char pointer; and
5 generating an error to indicate a type violation to the programmer if the
6 second pointer is a pointer to a scalar.

1 14. (Original) The computer-readable storage medium of claim 11,
2 wherein if the first pointer is defined to point to a first structure type and the
3 second pointer is defined to point to a second structure type, the method further
4 comprises:
5 determining whether the first structure type and the second structure type
6 belong to the same alias group; and
7 if the first structure type and the second structure type do not belong to the
8 same alias group, generating an error to indicate a type violation.

1 15. (Original) The computer-readable storage medium of claim 14,
2 wherein determining whether the first structure type and the second structure type
3 belong to the same alias group involves:
4 keeping track of special program statements that link structure types into
5 alias groups;
6 determining that the first structure type and the second structure type
7 belong to the same alias group if the first structure type and the second structure

8 type are the same structure type, or if one or more special procedures link the first
9 structure type and the second structure type into the same alias group.

1 16. (Original) The computer-readable storage medium of claim 15,
2 wherein the method further comprises determining that the first structure type and
3 the second structure type belong to the same alias group if the first structure type
4 and the second structure type have all the same basic types in the same order.

1 17. (Canceled).

1 18. (Original) The computer-readable storage medium of claim 11,
2 wherein the method further comprises:
3 receiving an identifier for a set of constraints on memory references that a
4 programmer has adhered to in writing the computer program; and
5 using the identifier to select a type casting rule from a set of type casting
6 rules, the selected type casting rule being associated with the set of constraints;
7 wherein each type casting rule in the set of type casting rules is associated
8 with a different set of constraints on memory references.

1 19. (Original) The computer-readable storage medium of claim 11,
2 wherein the method is performed by a compiler.

1 20. (Original) The computer-readable storage medium of claim 11,
2 wherein the method is performed by an error checking application, which is not
3 part of a compiler.

1 21. (Currently amended) An apparatus that detects violations of type rules
2 in a computer program, comprising:

3 a receiving mechanism that is configured to receive the computer program
4 prior to compilation and execution;
5 wherein the receiving mechanism is configured to receive the computer
6 program in source code form; and
7 wherein the apparatus further comprises a parsing mechanism that is
8 configured to parse the computer program into an intermediate form prior to
9 locating a type casting operation
10 a locating mechanism that is configured to locate ~~a~~ the type casting
11 operation within the computer program, wherein the type casting operation
12 involves a first pointer and a second pointer; and
13 a type rule checking mechanism that is configured check the type casting
14 operation for a violation of a type rule, and if a violation is detected, to indicate
15 the violation.

1 22. (Currently amended) The apparatus of ~~claim 1~~ claim 21, wherein the
2 type rule checking mechanism is configured to determine if the first pointer is
3 defined to be a structure pointer and the second pointer is not defined to be a
4 structure pointer, and if so, to indicate a violation if no char exception applies.

1 23. (Original) The apparatus of claim 22, wherein the type rule checking
2 mechanism is configured to:
3 generate a warning to warn a programmer of a potential type violation if
4 the second pointer is a void or char pointer; and to
5 generate an error to indicate a type violation to the programmer if the
6 second pointer is a pointer to a scalar.

1 24. (Original) The apparatus of claim 21, wherein if the first pointer is
2 defined to point to a first structure type and the second pointer is defined to point
3 to a second structure type, the type rule checking mechanism is configured to:
4 determine whether the first structure type and the second structure type
5 belong to the same alias group; and to
6 generate an error to indicate a type violation if the first structure type and
7 the second structure type do not belong to the same alias group.

1 25. (Original) The apparatus of claim 24, wherein in determining whether
2 the first structure type and the second structure type belong to the same alias
3 group, the type rule checking mechanism is configured:
4 keep track of special program statements that link structure types into alias
5 groups; and to
6 determine that the first structure type and the second structure type belong
7 to the same alias group if the first structure type and the second structure type are
8 the same structure type, or if one or more special procedures link the first structure
9 type and the second structure type into the same alias group.

1 26. (Original) The apparatus of claim 25, wherein the type rule checking
2 mechanism is configured to determine that the first structure type and the second
3 structure type belong to the same alias group if the first structure type and the
4 second structure type have all the same basic types in the same order.

1 27. (Canceled).

1 28. (Original) The apparatus of claim 21, wherein the receiving
2 mechanism is configured to receive an identifier for a set of constraints on

3 memory references that a programmer has adhered to in writing the computer
4 program, and further comprising:
5 a selection mechanism that is configured to use the identifier to select a
6 type casting rule from a set of type casting rules, the selected type casting rule
7 being associated with the set of constraints;
8 wherein each type casting rule in the set of type casting rules is associated
9 with a different set of constraints on memory references.

1 29. (Original) The apparatus of claim 21, further comprising a compiler
2 that contains the receiving mechanism, the locating mechanism and the type rule
3 checking mechanism.

1 30. (Original) The apparatus of claim 21, further comprising an error
2 checking application, which is not part of a compiler;
3 wherein the error checking application contains the receiving mechanism,
4 the locating mechanism and the type rule checking mechanism.